One Thousand and Six Consecutive Laparoscopic Intraoperative Cholangiograms

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ABSTRACT

Intraoperative cholangiography was successfully performed in 1,000 out of 1,006 attempts in 1019 consecutive cholecystectomies. There were 783 chronic, 95 acute, 61 fibrotic, 27 gangrenous and 40 cases of hydrops of the gallbladder in those laparoscopic cholecystectomies performed. Unsuspected common duct stones were identified in 5% of the patients. There were no injuries resulting from intraoperative cholangiography performed via the cystic duct. In this large series, routine cholangiography was thought to be helpful in the prevention of common bile duct injuries and the establishment of abnormal anatomy. In non-acute cholecystitis, intraoperative cholangiography is necessary due to the importance of abnormal anatomy verification. The technique of laparoscopic cholecystectomy differs greatly from that of open technique, and, therefore, routine intraoperative cholangiography is strongly advised.

Key Words: Laparoscopic cholecyctectomy, Intraoperative cholangiogram.

INTRODUCTION

Laparoscopic cholecystectomy was attempted on all patients with documented gallbladder disease in this series. A laparoscopic cholangiogram was attempted on all cases of successfully completed laparoscopic cholecystectomy during exposure of the cystic duct. Cholelangiography was performed in every case despite preoperative findings, with or without preoperative ERCP.

METHODS

Laparoscopic cholectystectomy was initiated in the usual manner. Dissection of the cystic artery and cystic duct was completed, following which endoclips were placed on the cystic artery. The artery was not divided at this time. A single endoclip was placed on the cystic duct adjacent to the neck of the gallbladder. An incision was made distal to the cystic duct clip with curved micro-scissors introduced through the most lateral port. In the majority of cases a Taut catheter was inserted through an Olsen cholangiogram clamp and placed into the cystic duct. As a second option the Reddick balloon catheter was used for cholangiography. In two cases a cholangiogram was obtained by inserting a Reddick catheter into the body or fundus of the gallbladder. However, this technique was felt to be less informative than cystic duct cholangiography.

After catheter placement, the patient was placed in extreme Trendelenburg position to allow filling of hepatic radicals. Fluoroscopy was observed by the surgeon and the radiologist through a remote unit in the x-ray department. Two-way communication was available for discussion of the findings between the radiologist and surgeon. Permanent films were made for the patient's file. After radiologic verification of the anatomy and status of the common bile duct, the cystic duct was triple ligated and laparoscopic cholecystectomy was completed, provided no common duct stones were noted.

Our approach to common bile duct stones is as follows: Initially, glucagon is given to the patient, particularly with smaller stones. Hydroexpulsion, using a Nezhat-Dorsey

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Table 1.

1019 Consecutive Laparoscopic Cholecystectomies

1000 of 1006 attempted successful intraopeartive cholangiography:

783	chronic cholecystitis
95	acute cholecystitis
61	fibrotic
27	gangrenous
40	hydrops

Table 3.

42 Preoperative ECRP attempted in patients with CDS:

33	Successful (28 erroneously cleared the CD)
6	Unable to perform
	2 With known stones
3	Unable to remove stones

cannula with the cannula inserted through the cystic duct and pressures of 500 mm of mercury, is employed. A repeat cholangiogram is obtained, and if the stone has been removed, the common duct portion of the operation is terminated. If the stone has not been removed, a blind basket is passed into the duodenum via the cystic duct. The basket is opened and pulled back through the common bile duct to the common duct-cystic duct junction, at which time it is closed and the stone extracted if successfully snared in the basket. The Segura basket and flat-wire basket are most commonly used. If this maneuver is unsuccessful, a fluoroscopic-guided basket is passed into the common bile duct in an attempt to remove the stone. Failure of this method will initiate the use of a choledochoscope passed through the cystic duct to visualize the stone(s) and facilitate removal in the most appropriate manner. A basket is usually preferred. However, with larger stones, an electrohydraulic lithotriptor may be used to reduce stone size, following which the fragments may be flushed through the ampulla of Vater. One case of Morizzi's syndrome required the use of an electrohydraulic lithotriptor.

Table 2.

2	Observation.
1	Open CDE
18	Removal with post op ERCP
8	Laparoscopic choledochotomy
49	Cystic duct CDE
	19 Hydro-expulsion and Glucagon
	9 Basket
	1 Balloon catheter
	3 Basket with fluroscopic guidance
	3 Hydro-expulsion and balloon
	4 Hydro-expulsion and basket
	1 Balloon and basket
	9 Cystic duct choledochoscopy
	7 Basket
	2 Electrohydraulic lithotripsy

RESULTS

Of 1019 cases, conversion to open exploration was required in: four cases because of severe adhesions; seven cases of severe acute disease, fibrosis or abscess; one case of excessive bleeding in a patient on steroids with cirrhosis of the liver, previous renal transplantations and a non-reversible abnormal bleeding profile; and in one case of extensive bleeding from the liver bed.

Cholangiograms were attempted in the remaining 1006 cases and were successful in 1000 cases (99%). Inability to obtain cholangiograms occurred in six cases because of interference from Heister's valves (2 cases); complete fibrosis of the cystic duct (2 cases); and stones in the cystic duct (2 cases). Unsuspected stones were identified in 73 cases (5% of the total). Stones were removed as indicated in **(Table 2)**.

Most instances of ERCP removal of unsuspected stones occurred in the early part of the series when common duct exploration was just being attempted. The single patient converted to an open common duct exploration was an elderly male who had a stone lodged in a diverticulum of the common duct. No other conversions to open exploration were necessary. All other unsuspected common duct stones were treated laparoscopically. Preoperative ERCP was obtained in all patients with abnormal liver function studies or findings of common bile duct stones on preoperative ultrasound. Performing a preoperative ERCP allows the surgeon to have information on the ability to perform such a procedure. It is our routine that in those patients who have had preoperative ERCP that was successful in removing stones, if additional stones are found at the time of surgery, these stones are removed laparoscopically. However, if laparoscopic removal would necessitate a choledochotomy and T-tube insertion, these patients are treated with ERCP postoperatively to avoid the morbidity of T-tube placement. If preoperative ERCP was unsuccessful,

the patient will undergo laparoscopic choledochotomy. If ERCP had not been performed preoperatively and choledochotomy is necessary for stone removal, laparoscopic choledochotomy is performed to prevent further therapeutic interventions.

Intraoperative cholangiography revealed missed stones in 28 patients who had preoperative ERCP (Table 3).

Five (5) patients with known common bile duct stones were included in this series. These patients are included in (Table 2).

Abnormal or confusing anatomy was encountered in 23% of the cases. Shortened cystic ducts are most commonly found in acute cholecystitis and represent a hazard for common bile duct injury. The cystic duct-common hepatic duct junction is frequently unclear and in those with a long cystic duct, identification of the junction is tedious and potentially hazardous. As noted under "Methods," endoclips are placed on the cystic artery prior to cholangiography. In one case in this series, an endoclip partially occluded the common bile duct. The clip was removed and the patient had an uneventful postoperative course.

In one patient the cystic duct-common duct junction was erroneously identified and an incision was made at this junction. Had this patient not underwent cholangiography, division of the common bile duct would likely have occurred. A T-tube was placed in the incision and the patient had an uneventful postoperative course.

There were eight other complications in this series. The second patient of the series had abnormal bleeding from the gallbladder bed necessitating conversion to an open procedure. Two patients had postoperative port-site bleeding, which resolved without re-operation. However, closer attention to bleeding from port-sites has prevented this problem in the latter part of the series. There were two postoperative bile leaks from the gallbladder bed in the early part of the series which were drained laparoscopically. Both of these leaks originated from the duct of Luschka. Had these bile leaks occurred in the latter part of the series, ERCP would have been utilized to stent the common bile duct, and the biloma drained radiographically. There was one minor infection of an umbilical port and one hernia of the umbilical port. One patient developed postoperative jaundice which was evaluated by percutaneous transhepatic cholangiography because ERCP could not be performed. The patient had a constricted bile duct. Clips had been placed in close proximity to the common bile duct but did not traverse the common duct. The patient underwent stenting of the common bile duct for three weeks, following which the stent was removed. The patient has been followed four years and continues to do well. There were no common bile duct injuries in this series.

DISCUSSION

The role of cholangiography has been controversial in the era of open cholecystectomy and remains so during the development of laparoscopic cholecystectomy. Though the gallbladder is removed during both open and laparoscopic cholecystectomy, laparoscopic cholecystectomy is a entirely different procedure from that of the open method.[1-8]

Patients with abnormal liver function studies should undergo preoperative ERCP to establish the ability to do the procedure and to completely evaluate these patients. ERCP will help address the management of unsuspected common bile duct stones found at the time of laparoscopic cholecystectomy. It is the author's opinion that all patients with abnormal liver function studies, despite ERCP findings, should undergo intraoperative cholangiography. Patients with acute cholecystitis, who require verification of anatomy, also represent a very strong indication for intraoperative cholangiography.[9] A 5% incidence of unsuspected common bile duct stone indicates that intraoperative cholangiography is a useful tool. However, more importantly, intraoperative cholangiography appeared to be useful in contributing to the lack of common bile duct injuries noted in this series. Cystic duct cholangiography is preferred to cholecystocholangiography because of the more accurate delineation of anatomy. However, cholecystocholangiography is better than no cholangiography at all. Fluoroscopy is of greater benefit than static films, although static films are better than no films at all and should be obtained for permanent records in all cases.

If routine cholangiograms are performed, the surgeon and his assistants are able to reduce the time of surgery for this portion of the procedure to an average of 3.5 minutes per procedure with an additional expense for equipment of $10 to $15.

CONCLUSIONS

Routine cholangiography on 1000 patients revealed a 5% incidence of unsuspected common bile duct stone. However, of more importance was the absence of common bile duct injuries in this large series. If done frequently, intraoperative cholangiography becomes more easy to do and familiarizes the surgeon with the technique so that it can be performed when absolutely necessary.[1,10] Intraoperative cholangiography does not prevent common duct injuries, nor is it an absolute requirement of laparoscopic cholecystectomy. However, whenever there is doubt in the course of laparoscopic cholecystectomy, perform an intraoperative cholangiogram.[11] "Don't consider laparoscopic cholangiography - just do it."

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